## Claims

[c1] A comprehensive NG processor for removing the moisture and recovering the higher hydrocarbons (i.e., $C_2^+$) therein comprising:
an integrated NG processor comprising a dehydration section and an absorption section and connected to the raw NG inlet pipeline and the lean NG outlet pipeline;
a heat-transport medium cooler connected to the medium inlet and transfer pipelines;
an absorbent cooler connected to the absorbent inlet and recycle pipelines;
a fractional distiller connected to the rich oil transfer and outlet pipelines, the absorbent outlet pipeline, and the product outlet pipeline.
an inhibitor regenerator connected to the effluent transfer pipeline, the inhibitor recycle pipeline and the wastewater discharge pipeline;
a refrigeration unit connected to the refrigerant inlet and outlet pipelines; and
a pipeline for delivering the lean NG.

[c2] A comprehensive NG processor of claim 1 wherein the dehydration section and its accessories are operated independently as a pure NG dehydrator without incorporating the absorption section and its accessories.

[c3] A comprehensive NG processor of claim 1 wherein a heat transport medium is in directly contact with the counter-flowing NG in the dehydration section.

[c4] A comprehensive NG processor of claim 1 wherein an absorbent is in directly contact with the counter-flowing NG in the absorption section.

[c5] A comprehensive NG processor of claim 1 wherein the heat-transport medium contains a gas-hydrate inhibitor.

[c6] A comprehensive NG processor of claim 1 wherein the refrigeration unit is an industrial refrigerator.

[c7] A comprehensive NG processor of claim 1 wherein the refrigeration unit is a NG expansion device.

[c8] A comprehensive NG processor of claim 7 wherein a gas-hydrate inhibitor is

injected into the NG before entering the NG expansion device.

[c9] A comprehensive NG processor of claim 7 wherein the NG expansion device is a gas expansion valve.

[c10] A comprehensive NG processor of claim 7 wherein the NG expansion device is a turbo expander-compressor.

[c11] A comprehensive NG processor of claim 7 wherein the NG expansion equipment is a free piston NG expander-compressor comprising:
A gas expansion cylinder and a gas compression cylinder;
A co-shaft gas expansion piston and gas compression piston; and
The gas inlet and outlet pipelines for each cylinder.